

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FILTER STRIP (ACRE)

CODE 393

DEFINITION

A strip or area of herbaceous vegetation situated between cropland, grazingland, or disturbed land (including forestland) and environmentally sensitive areas.

PURPOSE

- To reduce sediment, particulate organics, and sediment adsorbed contaminant loadings in runoff.
- To reduce dissolved contaminant loadings in runoff.
- To serve as Zone 3 of **Field Office Technical Guide (FOTG), Section IV–Practice Standards and Specifications, 391–Riparian Forest Buffer.**
- To reduce sediment, particulate organics, and sediment adsorbed contaminant loadings in surface irrigation tailwater.
- To restore, create or enhance herbaceous habitat for wildlife and beneficial insects.
- To maintain or enhance watershed functions and values.
- **To utilize excess nutrients found in runoff water and ground water.**
- **To manage bacteria in runoff from livestock confinement areas.**

CONDITIONS WHERE PRACTICE APPLIES

This practice applies:

1. In areas situated below cropland, grazing land, **animal confinement areas**, or disturbed land (including forest land);
2. Where sediment, particulate matter and/or dissolved contaminants may leave these areas and **have the potential for** entering environmentally sensitive areas **via surface or subsurface flow**;
3. In areas where permanent vegetative establishment is needed to enhance wildlife and beneficial insects, or maintain or enhance watershed function;
4. This practice applies when planned as part of a conservation management system.

CRITERIA

General Criteria Applicable to All Purposes

Filter strips shall be designated as vegetated areas to treat runoff **or subsurface flow** and are not part of the adjacent cropland rotation.

Overland flow entering the filter strip shall be primarily sheet flow. Concentrated flow shall be dispersed.

State listed noxious weeds will not be established in the filter strip and will be controlled if present.

Filter strip establishment shall comply with local, state, tribal, and federal regulations.

When specific local or Montana State law or regulation concerning the design, implementation, and maintenance of filter strips differ from these criteria, local or state law will take precedence.

**NRCS, MT
March 2004**

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard contact the Natural Resources Conservation Service.

NOTE: This type of font (**AaBbCcDdEe 123..**) indicates NRCS National Standards.
This type of font (**AaBbCcDdEe 123..**) indicates Montana Supplement.

Additional Criteria to Reduce Sediment, Particulate Organics and Sediment-Adsorbed Contaminant Loadings in Runoff

Filter strip flow length shall be determined based on field slope percent and length, and filter strip slope percent, erosion rate, amount and particle size distribution of sediment delivered to the filter strip, density of the filter strip vegetation, and runoff volume associated with erosion producing events. The minimum flow length (**parallel to run on flow**) for this purpose shall be 25 feet. **Utilize TABLE 1 to adjust filter strip width based on field slope and texture above the strip.**

Filter strip location requirements:

- The filter strip shall be located along the downslope edge of a field or disturbed area. To the extent practical, it shall be placed on the approximate contour. Variation in placement on the contour should not exceed a 0.5% longitudinal (perpendicular to the flow length) gradient.
- The drainage area above the filter strip shall have greater than 1 percent but less than 10 percent slopes.
- The ratio of the drainage area to the filter strip area shall be less than 70:1 in regions with RUSLE-R factor values 0-35, 60:1 in regions with RUSLE-R factor values 35-175, and 50:1 in regions with RUSLE-R factor values of more than 175.
- The average annual sheet and rill erosion rate above the filter strip shall be less than 10 tons per acre per year
- **The sediment delivery ratio (the amount of sediment coming off the filter strip), using RUSLE2 erosion prediction technology, shall be less than 1 T/A/Y.**

The filter strip shall be established to permanent herbaceous vegetation consisting of a single species or a mixture of grasses, legumes, and/or other forbs adapted to the soil, climate, and nutrients, chemicals, and practices used in the current management system. Species selected shall have stiff stems and a high stem density near the ground surface. Stem density shall be such that the stem spacing does not exceed one inch.

Select plant species, which are suited to meet the objectives of the producer and are adapted to local soil and moisture conditions. Bunch-forming species are limited to 15% PLS of the mixture.

See TABLE 1, **Grass Species Characteristics and Adaptability**, located in the FOTG, Section IV–Practice Standards and Specifications, 393–Filter Strip specification, for species adaptation.

Where fast establishment of cover is important annual ryegrass or spring seeded small grain crops may be used to ensure adequate protection the first year of establishment. With the exception of spring-seeded winter wheat, small grain crop should be terminated prior to seed head formation.

TABLE 1. Minimum Width of Filter Strips Related to Slope and Soil Texture

| Field Slope | Minimum Filter Strip Length (ft) | |
|-------------|----------------------------------|---------|
| | Soil Texture Adjustment* | |
| | A | B |
| 1-3% | 25 feet | 25 feet |
| 4-7% | 35 feet | 40 feet |
| 8-10% | 50 feet | 55 feet |

* A = FSL, SL, COSL, LVFS, LFS

B = CL, SC, SIC, CL, SICL, SCL, SI, L, SIL, VFSL

Additional Criteria to Reduce Dissolved Contaminants in Runoff

The criteria given in “Additional criteria to reduce sediment, particulate organics and sediment adsorbed contaminant loadings in runoff” also apply to this purpose.

Filter strip flow length required to reduce dissolved contaminants in runoff shall be based on management objectives, contaminants of concern, and the volume of runoff from the filter strip's drainage area compared with the filter strip's area and infiltration capacity.

The flow length determined for this purpose shall be in addition to the flow length determined for reducing sediment, particulate organics and sediment-adsorbed contaminant loadings in runoff.

The minimum flow length for this purpose shall be 30 feet. **Using TABLE 2 adjust filter strip width based on the field slope and soil texture.**

TABLE 2. Minimum Width of Filter Strips Related To Slope and Soil Texture

| Field Slope | Minimum Filter Strip Length (ft) | |
|-------------|----------------------------------|---------|
| | Soil Texture Adjustment* A | B |
| 1-3% | 35 feet | 35 feet |
| 4-7% | 45 feet | 50 feet |
| 8-10% | 60 feet | 65 feet |

* A = FSL, SL, COSL, LVFS, LFS

B = CL, SC, SIC, CL, SICL, SCL, SI, L, SIL, VFSL

Additional Criteria to Serve as Zone 3 of FOTG 391–Riparian Forest Buffer

Except for the location requirements, the criteria given in “**Additional criteria to reduce sediment, particulate organics and sediment adsorbed contaminant loadings in runoff**” also apply to this purpose.

If concentrated flows entering Zone 3 are greater than the filter strip’s ability to disperse them, other means of dispersal, such as spreading devices, must be incorporated.

Use TABLE 1 to adjust filter strip width for slope and soil texture.

Additional Criteria to Reduce Sediment, Particulate Organics and Sediment-adsorbed Contaminant Loadings in Surface Irrigation Tailwater

Filter strip vegetation may be a small grain or other suitable annual with a plant spacing that does not exceed three inches.

Filter strips shall be established early enough prior to the irrigation season so that the vegetation can withstand sediment deposition from the first irrigation. **With the exception of spring seeded winter wheat clip vegetation prior to seed head formation.**

The flow length shall be based on management objectives. **Use TABLE 1 to adjust filter strip width for slope and soil texture.**

Additional Criteria to Restore, Create, or Enhance Herbaceous Habitat for Wildlife and Beneficial Insects

If this purpose is intended in combination with one or more of the previous purposes, then the minimum criteria for the previous purpose(s) must be met.

Additional filter strip flow length devoted to this purpose must be added to the length required for the other purpose(s).

Any addition to the flow length for wildlife or beneficial insects shall be added to the downhill slope of the filter strip.

Vegetation to enhance wildlife may be added to that portion of the filter strip devoted to other purposes to the extent they do not detract from its primary functions.

Plant species selected for this purpose shall be for permanent vegetation adapted to the wildlife or beneficial insect population(s) targeted.

If this is the only purpose, filter strip width and length shall be based on requirements of the targeted wildlife or insects. Density of the vegetative stand established for this purpose shall consider targeted wildlife habitat requirements and encourage plant diversity. Dispersed woody vegetation may be used to the extent it does not interfere with herbaceous vegetative growth, or operation and maintenance of the filter strip.

The filter strip shall not be mowed during the nesting season of the target wildlife.

Livestock and vehicular traffic in the filter strip shall be excluded during the nesting season of the target species.

Additional Criteria to Maintain or Enhance Watershed Functions and Values

Filter strips shall be strategically located to enhance connectivity of corridors and non-cultivated patches of vegetation within the watershed.

Filter strips shall be strategically located to enhance aesthetics of the watershed.

Plant species selected for this purpose shall be for establishment of permanent vegetation.

Additional Criteria to Utilize Excess Nutrients Found in Runoff Water and Ground Water

The criteria given in "Additional Criteria to reduce dissolved contaminants in runoff" also apply to this purpose. The design of the filter strip length should be such that runoff the end of the filter should be should be minimized.

Filter strips should be strategically located to intercept runoff and subsurface flow so that excess nutrients can be utilized by plant species. Select plant species that will utilize the greatest amount of nutrients in a specific time period. Where excess nutrients in runoff are a concern, sod-forming grasses should be predominant. Where subsurface flows are a concern, deep-rooted species should be included in the mixture (i.e., alfalfa, Birdsfoot trefoil).

Use TABLE 2 to adjust filter strip length for slope and soil texture.

Additional Criteria to Manage Runoff and Bacteria from Livestock confinement Areas

The filter strip shall be installed on the contour as much as practical with no more than 0.5 percent longitudinal gradient. Filter strip flow length will be at least 75 feet. See TABLE 3 to adjust width for slope and soil texture.

Total removal of coliform bacteria will not occur unless filter strip is designed to eliminate flow past the strip itself. Additional structures may be needed to eliminate contamination to a water body including diversions, a settling basin, or dike.

Select vegetative species that will remain upright during flows. Select plant species that are adapted to local soil and moisture conditions.

TABLE 3. Minimum Length of Filter Strips related to Slope and Soil Texture

| Field Slope | Minimum Filter Strip Length (ft) | |
|-------------|----------------------------------|----------|
| | Soil Texture Adjustment* | |
| | A | B |
| 1-3% | 75 feet | 100 feet |
| 4-7% | 100 feet | 125 feet |
| 8-10% | 200 feet | 225 feet |

* A = FSL, SL, COSL, LVFS, LFS

B = CL, SC, SIC, CL, SICL, SCL, SI, L, SIL, VFSL

CONSIDERATIONS

Filter strips should be strategically located to reduce runoff, and increase infiltration and ground water recharge throughout the watershed.

Filter strips for the single purposes of wildlife/beneficial insect habitat or to enhance watershed function should be strategically located to intercept contaminants thereby enhancing air and water quality.

To avoid damage to the filter strip consider using vegetation that is somewhat tolerant to herbicides used in the up-slope crop rotation.

Increasing the width of the filter strip will increase the potential for capturing particulates **and** contaminants.

Consider using this practice to enhance the conservation of declining species of wildlife, including those that are threatened or endangered.

Consider using this practice to protect National Register listed or eligible (significant) archaeological and traditional cultural properties from potential damaging contaminants.

Filter strip size should be adjusted to a greater flow length to accommodate harvest and maintenance equipment.

Select grass species that sequester more carbon.

Increasing the width of filter strip will increase the potential for carbon sequestration.

Sod-forming species will normally reduce runoff most effectively. However, a mixture of sod-forming and bunch-forming species may be utilized where wildlife cover, food, and soil fertility are important.

Filter strips by themselves may not eliminate runoff. Complimentary practices may be necessary especially where receiving waters must be protected.

On filter strips 100 feet or longer, consider installing low berms or terraces at 50 foot intervals to intercept runoff and re-establish sheet flow.

PLANS AND SPECIFICATIONS

Based on this standard, plans and specifications shall be prepared for each specific field site where a filter strip will be installed. A plan includes information about the location, construction sequence, vegetation establishment, and management and maintenance requirements.

Specifications shall include:

- a) Length, width, and slope of the filter strip to accomplish the planned purpose (length refers to flow length across the filter strip).
- b) Species selection and seeding or sprigging rates to accomplish the planned purpose
- c) Planting dates, care and handling of the seed to ensure that planted materials have an acceptable rate of survival
- d) A statement that only viable, high quality and regionally adapted seed will be used
- e) Site preparation sufficient to establish and grow selected species
- f) **The Montana filter strip specification sheet and job sheet is required and must be placed in the field office case file.**

OPERATION AND MAINTENANCE

For the purposes of filtering contaminants, permanent filter strip vegetative plantings should be harvested (**and removed**) to encourage dense growth, maintain an upright growth habit and remove nutrients and other contaminants that are contained in the plant tissue.

Control undesired weed species, especially state-listed noxious weeds.

Prescribed burning may be used to manage and maintain the filter strip when an approved burn plan has been developed.

Inspect the filter strip after storm events and repair any gullies that have formed, remove unevenly deposited sediment accumulation that will disrupt sheet flow, reseed disturbed areas and take other measures to prevent concentrated flow through the filter strip.

Apply supplemental nutrients as needed to maintain the desired species composition and stand density of the filter strip.

To maintain or restore the filter strip's function, periodically regrade the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function, and then reestablish the filter strip vegetation, if needed. If wildlife habitat is a purpose, destruction of vegetation within the portion of the strip devoted to that purpose should be minimized by regrading only to the extent needed to remove sediment and fill concentrated flow areas.

Grazing shall not be permitted in the filter strip unless a controlled grazing system is being implemented. Grazing will be permitted under a controlled grazing system only when soil moisture conditions support livestock traffic without excessive compaction.

Fertilizer application may be necessary to adequately establish grass/legumes especially where topsoil has been removed and less fertile subsoil is the medium seeds are being planted into. Fertilizer should be placed near the seed. Nitrogen rates must be limited to prevent damage to the seedling. Broadcasting of fertilizer is not recommended due to the fact that a high percentage of broadcast fertilizer is used by weeds, which become more competitive with the developing grass or legume. When placing fertilizer near the seed, nutrients should be limited to; nitrogen—40 pounds per acre ($\text{N}_0_3\text{-N}$) and phosphorus 20 pounds per acre (P_2O_5). Seeding depth is vitally important for proper germination and a successful stand and should follow the FOTG, Section IV—Practice Standards and Specifications, 512—Pasture and Hayland Planting or 550—Rangeland Planting.

If weed control is needed, appropriate pesticides only will be used. Use and application of all pesticides must be in accordance with Federal and Montana State regulations and label directions. Pesticide recommendations must be made according to the Montana Weed Management Handbook.

REFERENCES

Fertilizer Guidelines for Montana, Montana State University, Extension Service Bulletin EB 161, January 2003.

Montana–Utah–Wyoming Weed Management Handbook, Extension Service of Montana State University, Utah State University, and University of Wyoming.

W.O. Thom and R.L. Blevins, Conservation Tillage and Filter Strips Trap Potential Water Contaminants, Extension Service, University of Kentucky. 1996.

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